

Rapid Runway Repair Planning Considerations



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Purpose

- Identify crews and equipment required to conduct RRR
- Identify planning requirements of material required to conduct RRR
- Identify communication requirements for effective RRR

Enabling Learning Objectives



- State the three main planning documents to estimate damage to an airfield
- Name the crews and equipment necessary to perform RRR
- Calculate the material requirements for crater repair
- Identify dispersal areas for personnel and equipment
- Name the types of communication requirements for RRR



RRR Planning

- RRR planning similar to engineer plan
- Goal of RRR planning
 - Be ready for the worst case damage scenario
 - Hold excess



RRR Planning

- Information available through:
 - Operation Orders
 - Contingency Plans
- Documents provide estimates of damage, number of craters, and MOS repair times
- Communication Plan
- Personnel and equipment dispersal plan



RRR Planning

- Seven steps to developing RRR plan:
 - Develop RRR organization
 - Determine personnel and equipment requirements to support RRR
 - Determine availability and assign personnel and equipment to support RRR
 - Identify material requirements to support RRR
 - Develop dispersal plan to support RRR
 - Develop comm plan to support RRR
 - Incorporate BRAAT Ops into ACE OPORD

Step #1: Develop RRR Organization



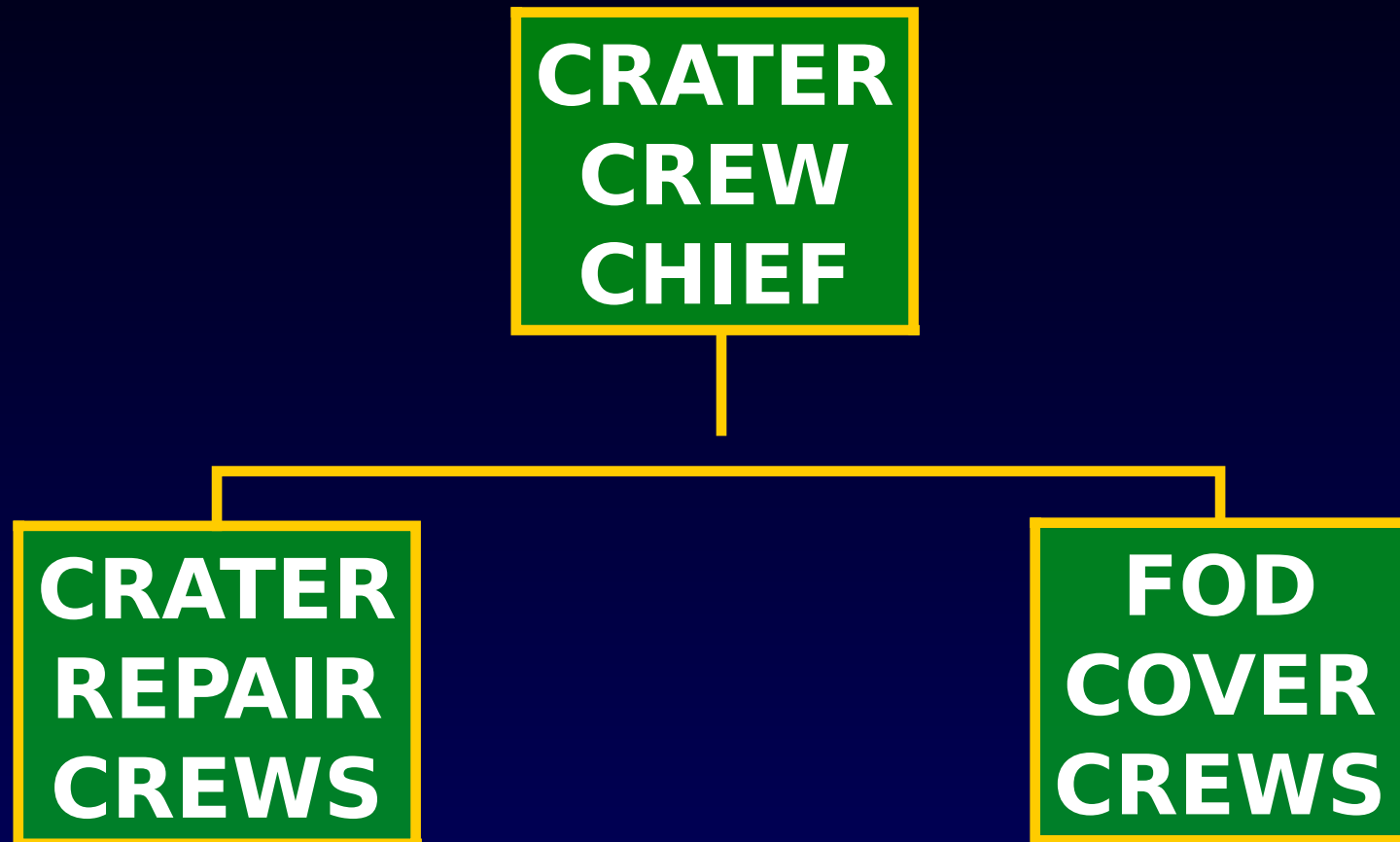
- RRR Organization falls under the control of the AGSOC
- Sub-function of BRAAT
- AGSOC assigns a RRR OIC to supervise and manage all the activities of RRR during recovery operations
- Normally one of the 1302/Combat Engineers out of Engr Ops Div



RRR Organization



RRR Organization: Crater Crew



RRR Organization: Crater Crew



- The Crater Crew is supervised by the Crater Crew Chief
 - Responsible for directing crater repair and FOD Cover Crews
 - Coordinates equipment and repairs on site
 - Ensure repairs done correctly

RRR Organization: Crater Crew



- Crater Repair Crews
 - Removes unwanted debris and ejecta
 - Repairs sub-grade and base course of crater
- FOD Cover Crews
 - Constructs and places operating surface over crater repair
- Ideally, you want one Crater Repair Crew per crater and one FOD Cover Crew for each type of FOD cover being used

RRR Organization: Crater Crew



- FOD Cover Crews
- Four types:
 - Concrete Cover Crew
 - Pre-cast Concrete Panel Crew
 - AM-2 Matting Crew
 - Fiberglass Reinforced Polyester (FRP) Panel Crew

RRR Organization: Hauling Crew

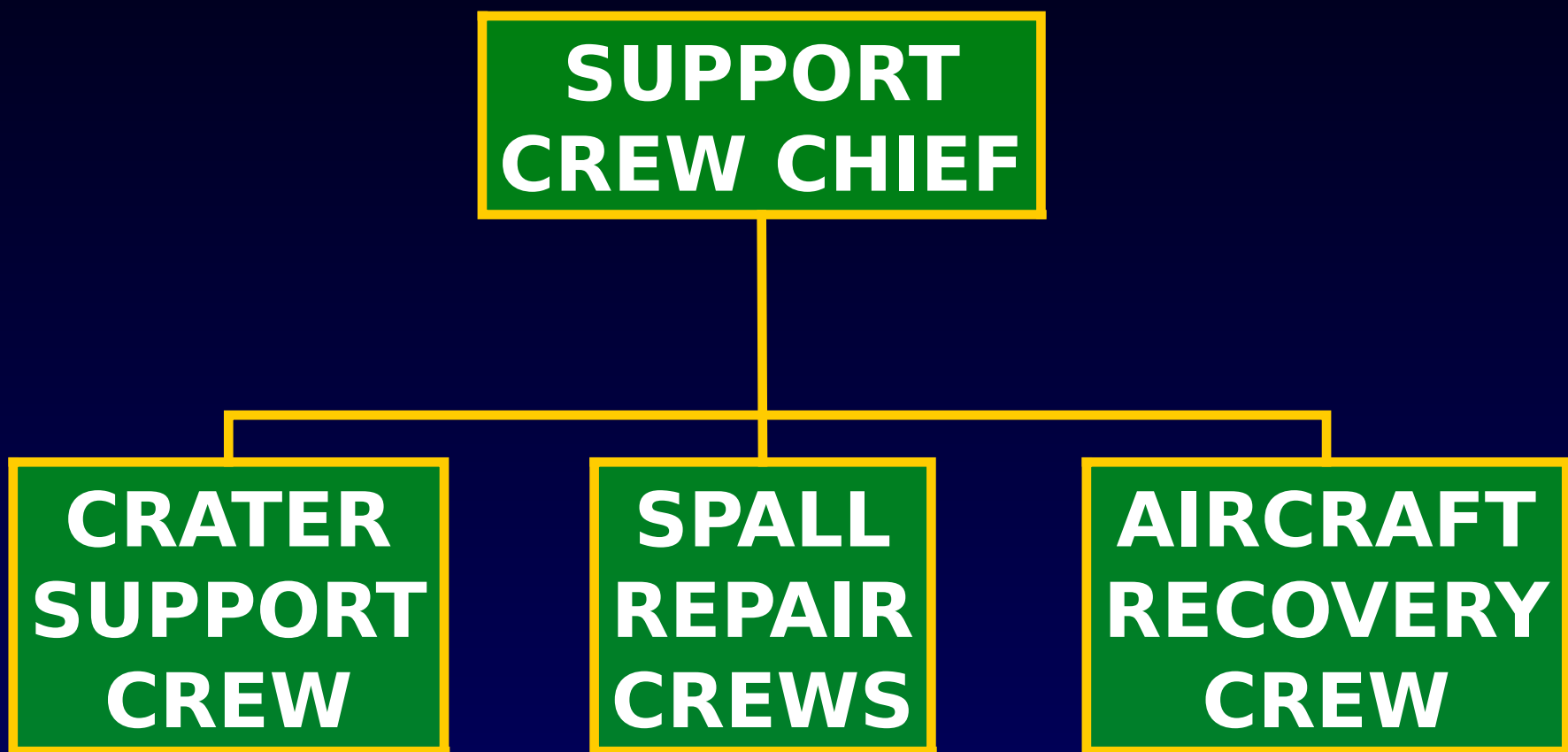


RRR Organization: Hauling Crew



- Hauling Crew Chief
 - Directs Hauling Crew
 - Ensures on time delivery and proper amounts of material delivered
- Hauling Crew
 - Transports all fill and FOD cover material to craters
 - Transports personnel to required locations

RRR Organization: Support Crew

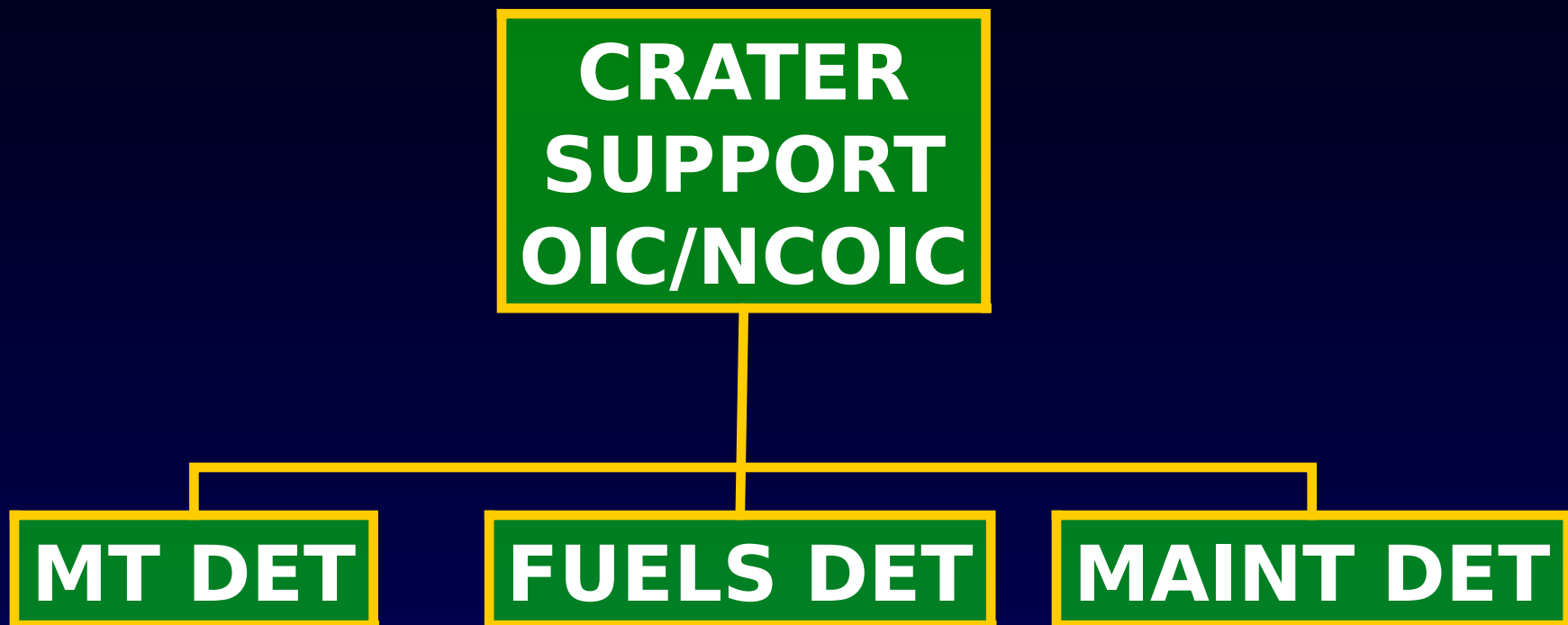


RRR Organization: Support Crew



- Support Crew Chief
 - Directs the efforts of the Crater Support OIC/NCOIC, Spall Repair Crew(s), and Aircraft Recovery OIC/NCOIC

RRR Organization: Crater Support Crew



RRR Organization: Crater Support Crew



- Crater Support OIC/NCOIC
 - Directs the MT, Fuels, and Maint Dets
 - Coordinates assets to refuel and repair RRR equipment as needed
 - Transports small amounts of fill material and FOD cover as needed

RRR Organization: Crater Support Crews



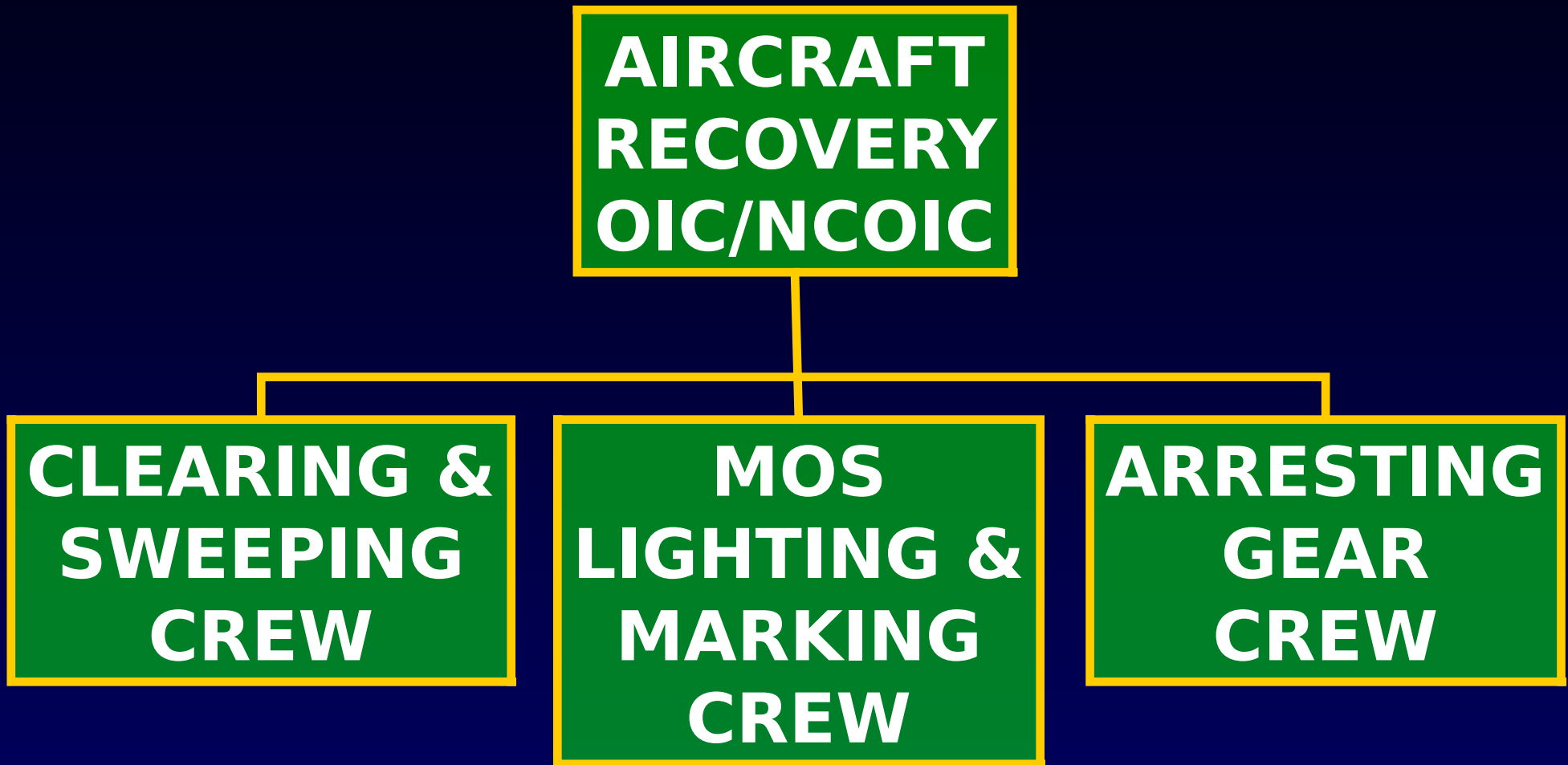
- Motor Transportation Detachment
 - Transports material shortfalls to the Crater and FOD Crews
- Fuels Detachment
 - Provides refueling support to all RRR equipment
- Maintenance Detachment
 - Provides rapid field maintenance to RRR equipment

RRR Organization: SPALL Repair Crew



- Spall Repair Crews
 - Repairs all spalls on the MOS
 - Total number of crews determined by personnel, equipment, and material availability
 - Repairs other spalls as necessary

RRR Organization: Aircraft Recovery



RRR Organization: Aircraft Recovery



- Aircraft Recovery OIC/NCOIC
 - Supervises Clearing and Sweeping Crew, MOS Lighting and Marking Crew, and Aircraft Arresting Gear Crew

RRR Organization: Aircraft Recovery



- Clearing and Sweeping Crew
 - Clears and Sweeps debris from MOS
- Aircraft Arresting Gear Crew
 - Replaces, repairs, and operates M-21 Arresting Gear

RRR Organization: Aircraft Recovery



- MOS Lighting and Marking Crew
 - Places distance and edge markers on MOS
 - Paints center line on MOS
 - Places airfield lighting on MOS

Step #2: Determine PERS/equip Requirements



- Based on RRR organization
- Ensure sufficient personnel of the right occupational specialties identified to accomplish tasks
- Ensure sufficient equipment identified or dedicated in order to accomplish missions

RRR PERS And Equip Requirements



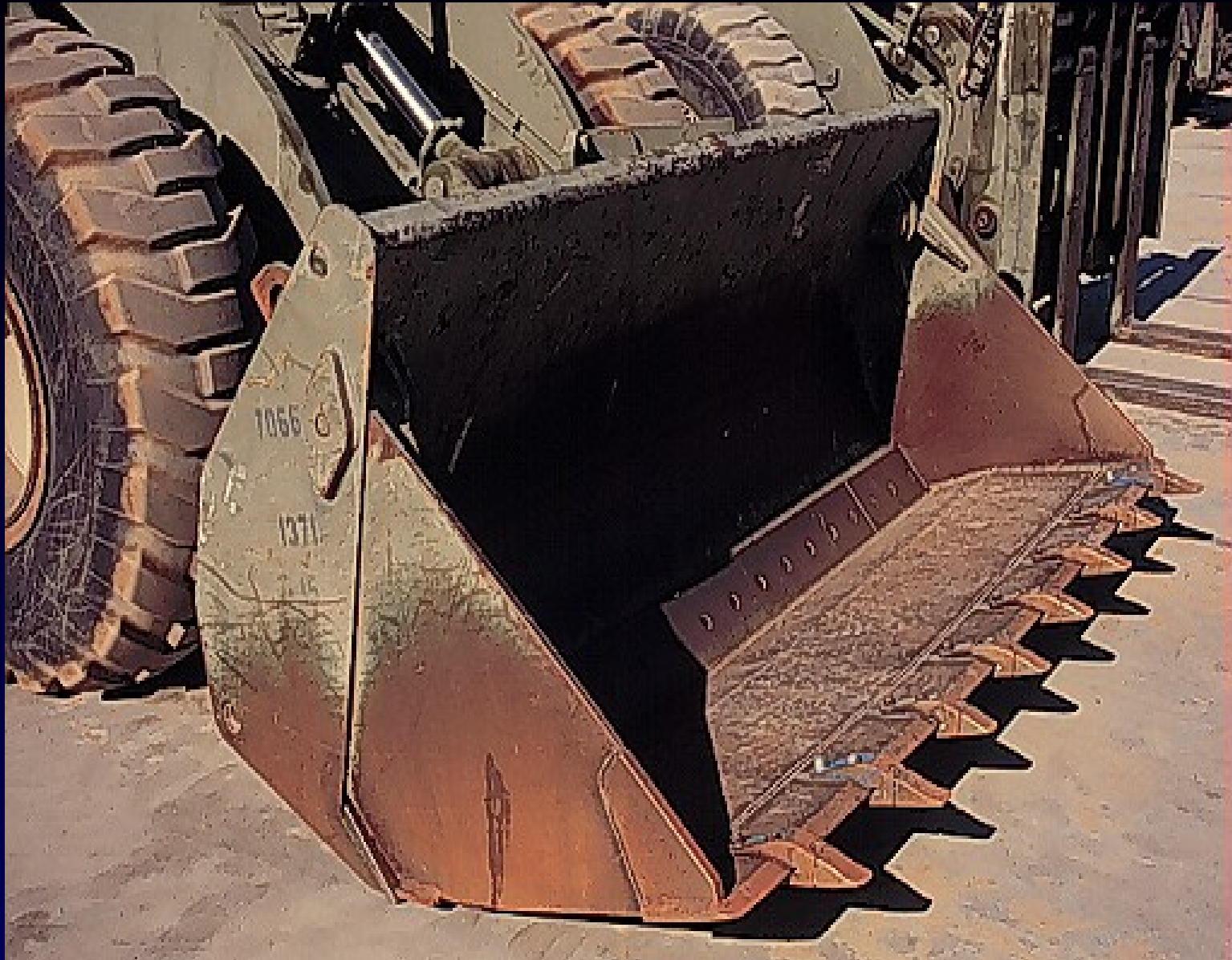
- Crater Crew Chief
 - Equipment:
 - 1 x Utility Vehicle
 - Personnel:
 - Crew Chief (preferably MOS 1371)
 - 1 x Driver (MOS 3531 MT Op or MOS 2531 Comm Op)



RRR PERS And Equip Requirements



- Crater Repair Crew
 - Equipment:
 - 1 x Front end Loader
 - 1 x Bulldozer
 - 1 x Vibratory Roller
 - 1 x Road Grader
 - 1 x Multipurpose Excavator
 - One or more Concrete Saws
 - Personnel:
 - 5 x MOS 1345 HE Operator
 - 8 x General Laborer (any MOS)











RRR PERS And Equip Requirements



- FOD Cover Crews
 - Four Types (one for each type of FOD):
 - Concrete Cover Crew
 - Pre-cast Concrete Cover Crew
 - AM-2 Matting Crew
 - FRP Panel Crew

RRR PERS And Equip Requirements



- FOD Concrete Cover Crew
 - Equipment:
 - 1 x Mobile Concrete Mixer
 - 1 x Front End Loader
 - 1 x Water Truck (also moves mixer)
 - 1 x EBFL or TRAM w/forks
 - PERSONNEL:
 - 2 x MOS 1345 HE Operator
 - 2 x MOS 1171 Utility Specialist
 - 1 x MOS 3531 MT Operator
 - 17 x General Laborer (any MOS)

RRR PERS And Equip Requirements



- FOD Pre-Cast Concrete Panel Crew
 - Equipment:
 - 1 x EBFL or TRAM w/forks
 - 1 x Lifting Beam
 - 1 x Vibratory Compactor
 - One or more Concrete Saws
 - Personnel:
 - 2 x MOS 1345 HE Operator
 - 17 x General Laborer (any MOS)

RRR PERS And Equip Requirements



- FOD AM-2 Matting Cover Crew
 - Equipment:
 - 1 x EBFL or TRAM w/forks
 - 1 x 5-TON Truck
 - Personnel:
 - 1 x MOS 1345 HE Operator
 - 1 x MOS 3531 MT Operator
 - 2 (minimum) x MOS 7011
 - 21 x General Laborer (any MOS)





RRR PERS And Equip Requirements



- FOD FRP Crew
 - Equipment:
 - 1 x EBFL or TRAM w/forks
 - 1 x RTCH
 - 1 x 5-TON TRUCK
 - PERSONNEL:
 - 2 x MOS 1345 HE Operators
 - 1 x MOS 3531 MT Operator
 - 12 x General Laborer (any MOS)

RRR PERS And Equip Requirements



- Hauling Crew Chief
 - Equipment:
 - 1 x Vehicle (HMMWV)
 - Personnel:
 - Crew Chief
 - 1 x MOS 3531 or 2531 MT Op / Comm Op

RRR PERS And Equip Requirements



- Hauling Crew
 - Equipment:
 - All available hauling assets (LVS, 5T, trailers, etc.)
 - 2 x Dump Trucks per Crater Crew
 - 3 x EBFL or TRAM w/forks
 - 3 x TRAM w/bucket
 - Personnel:
 - 6 x MOS 1345 HE Operators
 - “As Required” MOS 3531/33 MT Operators

RRR PERS And Equip Requirements



- Support Crew Chief
 - Equipment:
 - 1 x Vehicle
 - Personnel:
 - Crew Chief
 - 1 x MOS 3531 MT Op or MOS 2531 Comm Op

RRR PERS And Equip Requirements



- Crater Support OIC/NCOIC
 - Equipment:
 - 1 x Utility Vehicle
 - Personnel:
 - Crater Support OIC/NCOIC
 - 1 x MOS 3531 MT Op or MOS 2531 Comm Op

RRR PERS And Equip Requirements



- Motor Transportation Detachment
 - Equipment:
 - 2 x Dump Trucks
 - 2 x 5 Ton Trucks
 - Personnel:
 - 4 x MOS 3531 MT Operator / Driver

RRR PERS And Equip Requirements



- Maintenance Detachment
 - Equipment:
 - 2 x Field Maintenance Trucks
 - Personnel:
 - 2 x MOS 3521 MT Mechanic / Driver
 - 2 x MOS 1341 HE Mechanic
 - 2 x MOS 1141 Utility Mechanic

RRR PERS And Equip Requirements



- Fuels Detachment
 - Equipment:
 - 1 x Refueler (M970 or 5 Ton Truck w/Sixcon modules w/diesel fuel)
 - Personnel:
 - 1 x MOS 3531 MT Operator
 - 1 x MOS 1391 Bulk Fuels Specialist

RRR PERS And Equip Requirements



- Aircraft Recovery OIC/NCOIC
 - Equipment:
 - 1 x Vehicle
 - Personnel:
 - Aircraft Recovery OIC/NCOIC
 - 1 x MOS 3531 MT Op or 2531 Comm Op

RRR PERS And Equip Requirements



- Spall Repair Crew
 - Equipment:
 - 1 x Utility Vehicle
 - Personnel:
 - 1 x Spall Repair NCOIC (MOS 1371)
 - 1 x MOS 1371 Combat Engineer / Driver
 - 3 x General Laborer (any MOS)

RRR PERS And Equip Requirements



- Clearing and Sweeping Crew
 - Equipment:
 - 1 x Road Grader
 - 1 x TRAM w/bucket
 - 2 x Dump Truck
 - 1 x 250 CFM Compressor
 - All available Runway Sweepers
 - Personnel:
 - 2 x MOS 1345 HE Operator
 - 2 x MOS 1371 Combat Engineer
 - “As Required” MOS 3531 MT Operator

RRR PERS And Equip Requirements



- MOS Lighting and Marking Crew
 - Equipment:
 - 1 x Utility Vehicle
 - 1 x MOSL Kit or other lighting for MOS
 - Personnel:
 - “As Required” MOS 7011 EAF Crewman (driver)

RRR PERS And Equip Requirements



- Arresting Gear Crew
 - Equipment:
 - “As Required” M-21 Arresting Gear
 - 1 x EBFL or TRAM w/forks
 - 1 x 7 1/2 Ton Crane
 - 1 x Excavator
 - 1 x Utility Vehicle
 - Personnel:
 - 10 x MOS 7011 EAF Crewmen (driver)
 - 2 x MOS 1361 Drafter / Surveyor
 - 3 x MOS 1345 HE Operator

Step #3: Determine Availability And Assign PERS And Equipment



- MWSS personnel and equipment
- Airfield tenant unit augmentation
 - ACE, CSSD, and NMCB
 - Airfield Commander authorization
- MAGTF augmentation
 - ESB, FSSG and NCF
- HNS augmentation

RRR PERS / Equip Availability And Assignment



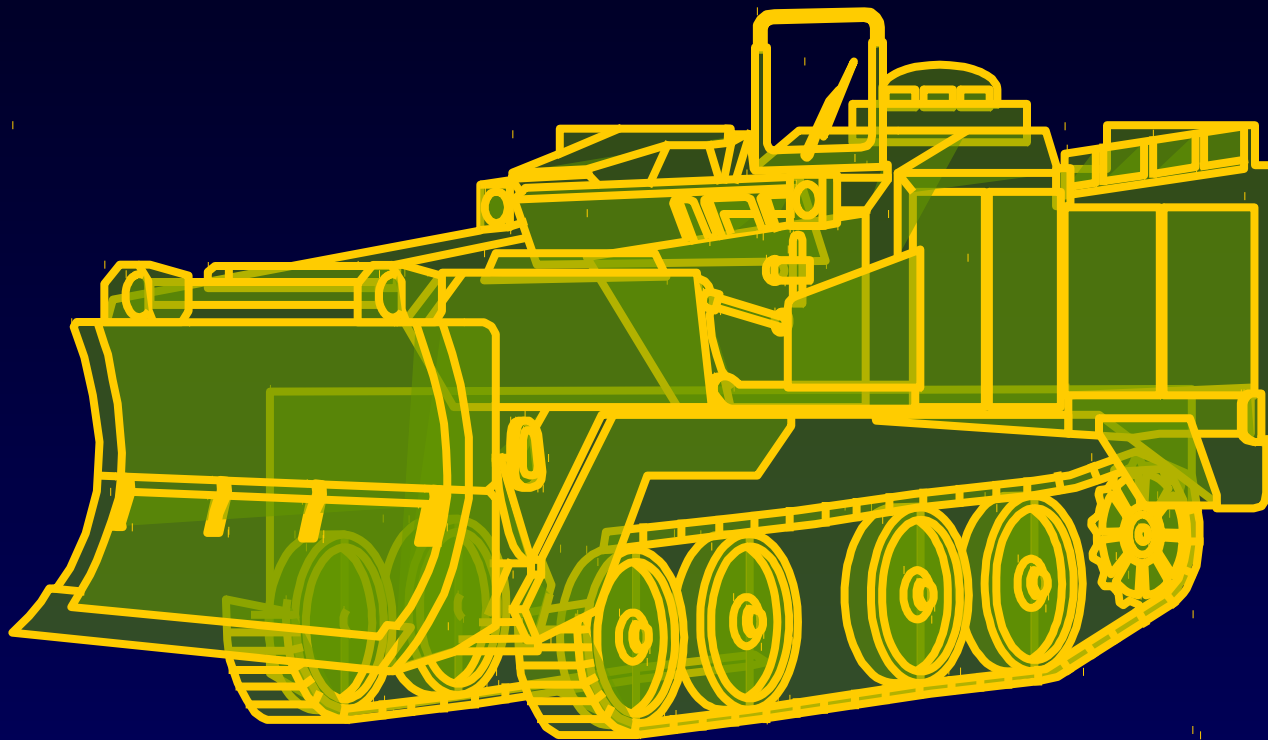
- Determine unit's ability to fill critical personnel and equipment requirements
- Provide the ACE S-4 with personnel and equipment shortfalls requiring MAGTF or HNS augmentation
- Use Equipment Availability Matrix
 - MWSS equipment
 - Airfield tenant unit (MWCG, CSSD and NMCB)

EQUIPMENT AVAILABILITY MATRIX



TYPE OF EQUIP	ORGANIC ASSETS	AUGMENTED ASSETS	REQUIRED ASSETS	SHORTFALLS
LOADERS				
DOZERS				
GRADERS				
ROLLERS				
EXCAVATOR				
CONCRETE				
MIXER DUMPS				
TRACTOR TRLR				
LVS				
5-T TRUCKS				
WATER TRUCK				
SWEEPERS				
FUEL TRUCK				
FLOOD LIGHTS				
COMPRESSORS				
FORKLIFTS				
PUMPS				
CONCRETE SAWS				
CRANES				
HMMWV				

Step #4: Identify RRR Material Requirements



RRR Material Requirements



- Three types of fill material:
 - Ballast Rock (4" minus)
 - Crushed Stone (1 1/2" minus)
 - Sand
- Calculating material requirements ensures adequate materials are requested or on hand in order to make repairs

RRR Material Requirements



- Calculating material requirements for crater repairs
 - Primary method is to do the math using the equations provided in Annex A of the Student Outline
 - Alternate method is to use the quick reference tables contained in outline

RRR Material Requirements



- Ballast Rock

- Used for wet craters or where backfill material is unsuitable
- Material Requirements
 - For a 20' actual diameter crater
 - Chart = 75 cu yd of ballast rock
 - Calculating for Cheap Ballast repair = 14 cu yd ballast rock and 7.6 cu yd crushed stone
 - For a 40' actual diameter
 - Chart = 300 cu yd of ballast rock
 - Calculation = 56 cu yd ballast / 30.7 cu yd crushed stone

RRR Material Requirements



- Crushed Stone
 - Well graded stone used for dry crater repairs
 - Ballast rock and/or backfilling the crater with ejecta is normally used to reduce the quantity of crushed stone
 - Material Requirements
 - For a 20' actual diameter crater
 - Chart = 30 cu yd of crushed stone
 - Calculating for Normal repair = 27.1 cu yd crushed stone
 - For a 40' actual diameter crater
 - Chart = 120 cu yd; Calculating = 108.5 cu yd

RRR Material Requirements



- Sand
 - Mainly used in conjunction with the sand grids
 - Material Requirements
 - For a 20' actual diameter crater
 - Chart = 20 cu yd of sand
 - Calculating = 19.3 cu yd
 - For a 40' actual diameter crater
 - Chart = 80 cu yd of sand
 - Calculating = 77.3 cu yd

RRR Material Requirements



- Four Types of FOD Cover
 - FRP Panels
 - AM-2 Matting
 - Rapid Set Concrete
 - Precast Concrete Panels
- Final option to use only in emergency situations is to use Crushed Stone without FOD cover

RRR Material Requirements



- Fiberglass Reinforced Polyester (FRP) Panels
 - Must extend beyond the edge of the repaired crater in order to give stability support for anchoring
 - Material Requirements
 - Craters 20 ft or less require 5 feet of overhang
 - Craters 20 ft or greater require 10 ft overhang

RRR Material Requirements



- AM-2 Matting
 - Must extend two feet on all sides of repaired crater to give proper anchoring support
 - Material Requirements
 - A 20 foot diameter crater requires 576 sq ft of matting
 - A 40 foot diameter crater requires 1936 sq ft of matting

RRR Material Requirements

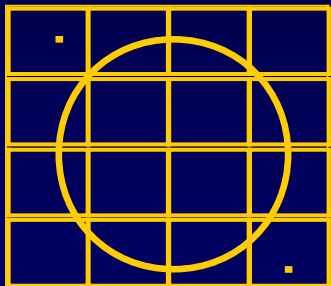


- Rapid Set Concrete
 - Same as ready mix or batch mix
 - Material Requirements
 - Determine volume of the repair in feet and divide by 27 to determine cu yds requirement
 - Square Volume = $L \times W \times H$
 - Cylinder Volume = $[0.7854 \times \text{Diameter}^2 \times \text{Depth}]$ or $[3.1416 (\text{Pi}) \times \text{Radius}^2 \times \text{Depth}]$
 - Each cu yd of concrete requires:
 - Eight bags of Portland Cement
 - One cu yd each of $\frac{3}{4}$ " aggregate and sand
 - Water as required

RRR Material Requirements

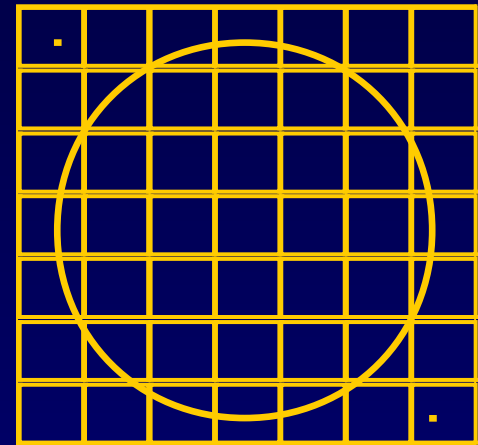


- Precast Concrete Panels
 - Usually 2 x 2 meters (6.5' x 6.5')
 - Used in colder climates
 - Material Requirements
 - A 20 foot diameter repair requires 16 panels
 - A 40 foot diameter repair requires 49 panels



SMALL CRATER

LARGE CRATER



RRR Material Requirements



- Crushed Stone without FOD Cover
 - Determine volume of repair in feet and divide by 27 to determine cu yds requirement
 - Add four inches to depth to allow for compaction
 - Not a prescribed method of repair for runways or taxiways

RRR Material Requirements



- Five Types of Spall Repair Materials
 - Silical
 - Cold Mix Asphalt
 - Penatron (Polymer)
 - Magnesium Phosphate
 - Rapid Set Concrete

RRR Material Requirements



- Silical
 - Powder mixed with a catalyst, a hardener, and an accelerator
 - Pea gravel can be added if/as required
 - Used only if spall is two inches or deeper
 - Unusable for asphalt surfaces

RRR Material Requirements



- Cold Mix Asphalt
 - Used for temporary patches only
 - Fill spall to within 1 1/2" of the surface with well graded and compacted crushed stone
 - Apply 2 1/2" of Cold Mix Asphalt and compact till flush with surface

RRR Material Requirements



- Penatron
 - Comes in two components that are mixed together to form the material: mixing Component A with Component B = Penetron
 - Sets within 7-9 minutes
 - Trafficable within 45 minutes of application

RRR Material Requirements



- Magnesium Phosphate
 - Mixes within 1-2 minutes using a concrete mixer
 - Can be extended 50% by adding pea gravel
 - Must use immediately
 - Unusable with asphalt surfaces

RRR Material Requirements



- Rapid Set Concrete
 - Mixture of Portland Cement, aggregate, sand, and water
 - Considered a permanent repair
 - Quick, easy, and familiar

RRR Material Requirements



- Material Requirement Planning
 - Step #1 - Determine number of craters and spalls requiring repair
 - As default, plan on repairing 12 x 35' diameter craters and 400 x 2' spalls on the MOS
 - Step #2 - Identify type(s) of repair for each
 - Step #3 - Determine material requirements
 - Step #4 - Record requirements using the Material Availability Matrix

Step #5: Develop RRR Dispersal Plan



- Personnel & Equipment
 - Use existing terrain and facilities
 - Harden structures and build bunkers/shelters
 - Provide cover and concealment
- Material Stockpiles
 - Disperse into numerous locations
 - Underground preferred
 - Easily accessible and within 2 miles of airfield

Step #6: Develop RRR Communications Plan



- Communications is critical
- Redundancy is essential
- Communication Options
 - Base Telephone
 - Radio
 - Field Phone
 - Messenger

Step #7: Incorporate RRR Plan Into Ace OPORD



- Once plan is complete, put on paper
- ACE Operations Order or Unit Operations Order
 - ANNEX B: Intelligence
 - Threat capability assessment
 - ANNEX C: Operations
 - Pre and post attack actions, crater repair procedures, EOD and NBCD procedures, equipment



Ace Operation Order

- Operation Order (cont.):
 - ANNEX D: Logistics
 - Resources and material availability, medical, field messing
 - ANNEX E: Training



Summary

- Documents to support RRR
- What types of damage to expect
- RRR Organization
- RRR Planning Factors
- Dispersal Requirements
- Communications
- Where RRR Planning can/should go within ACE and Squadron Op Orders

Questions?

